

### **3.0 ALTERNATIVES CONSIDERED**

An EIS must identify and explain the “range of alternatives.” This includes all reasonable alternatives, which must be rigorously explored and objectively evaluated, and all other alternatives that are eliminated from detailed study with a brief discussion of the reasons for their being judged to be unreasonable.

The Proposed Action, Construction and Operation of New USAMRIID Facilities and Decommissioning and Demolition and/or Re-use of Existing USAMRIID Facilities on Area A of Fort Detrick, Maryland, is presented in detail in Section 2.0 in this EIS. The proposed new USAMRIID facilities will provide biocontainment laboratory space, animal facilities, and administrative offices, as well as operational and administrative support facilities. These will be located adjacent to the existing USAMRIID facilities on Area A of Fort Detrick, which will be decommissioned and either demolished or re-used following occupancy of the new USAMRIID facilities.

The construction will occur in two stages. Stage 1 will provide approximately 700,000 gsf of new building space for the replacement of outdated and compressed existing USAMRIID facilities in order to sustain the current mission and to expand medical T&E capacity in support of immediate DoD and national demand. Stage 2 will encompass approximately 400,000 gsf of new building space for the balance of USAMRIID's expanded mission and for additional capacity to meet intensified national requirements for medical T&E in support of biodefense research as well as to accommodate increased collaborative efforts among USAMRIID's mission partners. In addition, approximately 200,000 gsf of the existing USAMRIID facilities may be renovated and re-used for laboratory or non-laboratory use, to be determined by evolving biodefense requirements.

The existing USAMRIID facilities now house approximately 750 staff in approximately 500,000 gsf of floor space. At present, it is not known exactly how many persons will work in the new USAMRIID facilities. It is estimated that approximately 900 people will staff the Stage 1 building, and a total of approximately 1,300 people will be employed upon completion of Stage 2.

The proposed new USAMRIID facilities will be built adjacent to the existing USAMRIID facilities within the NIBC on Area A of Fort Detrick, Maryland, and near the biomedical research facilities of mission partners, including the Agricultural Research Service Foreign Disease-Weed Research Unit of the USDA, the NIAID IRF, and the DHS NBACC Facility.

The proposed new USAMRIID facilities will include biocontainment laboratories designed, constructed, and operated to BSLs -2, -3, and -4 and enhanced BSL-3 standards. The animal facilities will be designed, constructed and operated to ABSL-2 and enhanced ABSL-3 standards. (Note: BSLs and ABSLs are designations within a well-defined system established by the CDC and NIH consisting of facilities, equipment, and procedural guidelines designed to minimize risk of exposure to potentially hazardous biological pathogens for laboratory workers and the outside environment.) These BSL and ABSL facilities will enable USAMRIID researchers to safely conduct the research and development and medical T&E work required to support USAMRIID's evolving missions. The research conducted at USAMRIID has been and will continue to be solely defensive in nature. The United States Army does not conduct offensive chemical or biological weapon research in any way, and is firmly committed to compliance with both international and domestic law including, but not limited to, the *Convention*

*on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction and the Biological Weapons Anti-terrorism Act.*

The decommissioning and demolition and/or re-use of existing USAMRIID facilities will occur following occupancy of the new Stage 1 and Stage 2 buildings. Decommissioning will entail vacating and decontamination of USAMRIID laboratories and animal facilities in Buildings 1301, 1408, 1412, and 1425 using procedures developed by USAMRIID specifically for BSL -2, -3, and -4 laboratories. USAMRIID Buildings 1408, 1412, and 1414 will be demolished; the latter two buildings, both dating from 1958, are outdated and compressed. USAMRIID Building 1425, dating from 1969, will either be totally demolished or partially demolished, depending on the alternative selected. Additional structures to be demolished or removed within the scope of the Proposed Action will include Buildings 1413, 1415, 1436, and 1438. The decommissioned laboratories used by USAMRIID in Building 1301, which is operated by the USDA, will be available for renovation and re-use by the USDA.

The 2005 BRAC-stipulated creation of the Biodefense Center of Excellence at Fort Detrick may include relocation of 120 - 140 personnel currently assigned to medical biodefense research functions at the Walter Reed Army Institute of Research and the Naval Medical Research Center to the planned new Joint Medical Biological Defense Research Center of Excellence at Fort Detrick. Some of the laboratory functions required by the BRAC mission may be accommodated within the existing USAMRIID facilities after phased occupancy of Stage 1 by USAMRIID. The renovated space will provide flexibility for contingencies such as an extended delay of the Stage 2 construction or accommodation of organizations reassigned to Fort Detrick as a result of future BRAC Commission decisions.

For purposes of the USAMRIID EIS, the operational impacts of the BRAC components relocated to the existing USAMRIID facilities will be evaluated. Separate NEPA documentation analyzing all of the environmental, health, and socioeconomic impacts of the BRAC mission on Fort Detrick will be prepared by the USACE. This separate NEPA documentation will be contemporaneous with the USAMRIID EIS process.

Three reasonable alternatives for the Proposed Action have been evaluated in detail in this EIS. The evaluations of these reasonable alternatives are briefly discussed in Sections 3.1, 3.2 and 3.3 below. Environmental analyses of the reasonable alternatives are comprised of detailed discussion of the existing (baseline) environment in Sections 4.1 through 4.17, review of the environmental, health, and socioeconomic consequences of the Proposed Action and other reasonable alternatives in Section 5.2, and comparison of the Proposed Action to the other reasonable alternatives in Section 5.3.

Two additional alternatives that were identified have been rejected as unreasonable, and therefore, have not been evaluated in detail in this EIS. The rejected alternatives are described in Section 3.4, along with the reasons for their elimination.

### **3.1 ALTERNATIVE I - CONSTRUCTION AND OPERATION OF NEW USAMRIID FACILITIES AND DECOMMISSIONING AND DEMOLITION OF THE EXISTING USAMRIID FACILITIES ON AREA A OF FORT DETRICK, MARYLAND**

This alternative incorporates the construction, operational, decommissioning, and demolition activities discussed above. Except for the laboratories used by USAMRIID in USDA Building 1301, all of the existing USAMRIID facilities in the central portion of Area A of Fort Detrick will

be decommissioned and demolished following construction and occupancy of the proposed Stage 1 and Stage 2 buildings.

This will fulfill the purpose of and need for the Proposed Action by providing approximately 1,100,000 gsf of floor space with much-needed additional and state-of-the-art BSL-2, -3, -4, and enhanced BSL-3 laboratory capacity and ABSL-2 and enhanced ABSL-3 animal facilities for RDT&E activities in support of the current and expanded mission requirements of USAMRIID. Furthermore, locating the proposed new USAMRIID facilities on the NIBC is critical to maintaining interagency cooperation and coordination with the NIAID IRF and the DHS NBACC Facility, which were sited near the existing USAMRIID facilities in response to Congressional mandates.

### **3.2 ALTERNATIVE II - CONSTRUCTION AND OPERATION OF NEW USAMRIID FACILITIES AND DECOMMISSIONING AND PARTIAL DEMOLITION OF THE EXISTING USAMRIID FACILITIES AND RE-USE OF THE REMAINING FACILITIES ON AREA A OF FORT DETRICK, MARYLAND**

Under this alternative, which incorporates the construction, operational, decommissioning, and demolition activities discussed above, approximately half of Building 1425 will be decommissioned and demolished after construction and occupancy of the proposed Stage 1 and Stage 2 buildings. The remaining portion of Building 1425 (about 200,000 gsf) will be decommissioned, renovated, and re-used for laboratory or non-laboratory purposes (e.g., administrative offices or training), to be determined by evolving biodefense requirements. Except for the laboratories in USDA Building 1301, all other existing USAMRIID facilities in the central portion of Area A of Fort Detrick, as specified above, will be decommissioned and demolished.

This alternative will fulfill the purpose of and need for the Proposed Action by providing approximately 1,300,000 gsf of floor space, with much-needed additional and state-of-the-art BSL-2, -3 and -4 and enhanced BSL-3 laboratory capacity and ABSL-2 and enhanced ABSL-3 animal facilities in support of the current and expanded mission requirements of USAMRIID. Furthermore, locating the proposed new USAMRIID facilities on the NIBC is critical to maintaining interagency cooperation and coordination with the NIAID IRF and the DHS NBACC Facility, which were sited specifically near the existing USAMRIID facilities in response to Congressional mandates.

The environmental, health, and socioeconomic impacts of this alternative are described in Section 5.2. The proposed new USAMRIID facilities will incorporate state-of-the-art design features and safety procedures to minimize potential threats from infectious agents to laboratory and clinical personnel working within it and to adjacent communities.

This alternative would fulfill the purpose and need of the Proposed Action by providing approximately 1,300,000 gsf of floor space with much-needed additional and state-of-the-art BSL-2, -3, -4, and enhanced BSL-3 laboratory capacity and ABSL-2 and enhanced ABSL-3 animal facilities for RDT&E activities in support of the current and expanded mission requirements of USAMRIID. Under Alternative II, the renovated space in Building 1425 will provide flexibility for contingencies such as an extended delay of the Stage 2 construction or accommodation of organizations reassigned to Fort Detrick as a result of future BRAC Commission decisions. Alternative II provides both the necessary facilities to support the RDT&E activities of the current and expanded mission requirements of USAMRIID as well as

accommodation of the BRAC-stipulated relocations of medical biodefense research functions at the Walter Reed Army Institute of Research and the Naval Medical Research Center to Fort Detrick. Alternative II is considered the preferred option.

These potential advantages outweigh the negligible to minor increased environmental, health, and socioeconomic impacts and cost increments of this alternative relative to Alternative I.

### **3.3 ALTERNATIVE III - NO ACTION**

No Action, in this case, means not constructing and not operating the proposed new USAMRIID facilities. This alternative is not the preferred option because it does not address USAMRIID's critical need for expanded and state-of-the-art BSL-2, -3 and -4 and enhanced BSL-3 laboratory capacity and ABSL-2 and enhanced ABSL-3 animal facilities. Under the No-Action Alternative, USAMRIID would continue using its existing outdated, compressed, high-maintenance and energy-inefficient facilities at Fort Detrick at current levels of operation. USAMRIID would have to conduct significant portions of its RDT&E activities as an extramural program, using several dispersed facilities owned and operated by other government agencies, academic institutions, or private research institutes with appropriate state-of-the-art BSL-2, -3 and -4 and enhanced BSL-3 laboratory capacity and ABSL-2 and enhanced ABSL-3 animal facilities. Since the existing and planned high-level biocontainment laboratory and animal facility capacity nationwide, particularly at BSL-4, is limited and committed to other programs, as noted previously, this alternative is not compatible with USAMRIID's missions to meet current and future biological threats to U.S. military personnel and citizens.

This alternative is not the preferred option among the three reasonable alternatives, as demonstrated in Section 5.3. However, analyses of the environmental consequences of a No-Action Alternative are required under CEQ regulations [40 CFR 1502.14(d)]. Under this alternative, the potential environmental, health, and socioeconomic impacts in the vicinity of Fort Detrick associated with the two action alternatives would not occur. These impacts, both beneficial and adverse, would occur at the locations of the extramural research facilities conducting outsourced USAMRIID RDT&E activities.

### **3.4 REJECTED ALTERNATIVES**

In accordance with the CEQ regulations, the alternatives eliminated from further consideration are presented below, with a brief discussion of the reasons for their elimination. These alternatives will not be explored or evaluated within Sections 4.0 and 5.0 of this EIS.

#### **3.4.1 ALTERNATIVE IV - CONSTRUCTION AND OPERATION OF NEW USAMRIID FACILITIES ON AREA B OF FORT DETRICK, MARYLAND AND DECOMMISSIONING AND DEMOLITION AND/OR RE-USE OF EXISTING USAMRIID FACILITIES ON AREA A**

This alternative would fulfill the purpose of and need for the Proposed Action by providing much-needed additional and state-of-the-art BSL-2, -3 and -4 and enhanced BSL-3 laboratory capacity and ABSL-2 and enhanced ABSL-3 animal facilities in support of the current and expanded mission requirements of USAMRIID located within approximately two miles of the biodefense laboratories of mission partner agencies. Its environmental consequences would likely be similar to those of Alternative I or Alternative II, except for the specific location. Details of the construction and operation of the proposed new USAMRIID facilities and the

decommissioning and demolition and/or re-use of the existing USAMRIID facilities would be essentially the same as those of the Area A action alternatives.

However, Alternative IV has been rejected as unreasonable, and therefore it will not be evaluated in detail in the EIS. Although a specific substitute location for the proposed new USAMRIID facilities has not been identified on Area B of Fort Detrick, it would be further removed from the NIBC than for either Alternative I or Alternative II and, therefore, less favorable for utilization of existing infrastructure and for synergy among personnel from the mission-partner agencies and the new USAMRIID facilities. The location on Area B of Fort Detrick would not be consistent with Installation land use planning. In addition, it would require development of utilities and roadways, many of which already exist on Area A, and would result in greater potential environmental impacts than those of the Area A action alternatives.

#### 3.4.2 ALTERNATIVE V - CONSTRUCTION AND OPERATION OF NEW USAMRIID FACILITIES AT A LOCATION OUTSIDE FORT DETRICK AND DECOMMISSIONING AND DEMOLITION AND/OR RE-USE OF EXISTING USAMRIID FACILITIES ON AREA A OF FORT DETRICK, MARYLAND

This alternative would partially fulfill the purpose and need for the Proposed Action by providing much-needed additional and state-of-the-art BSL-2, -3 and -4 and enhanced BSL-3 laboratory capacity and ABSL-2 and enhanced ABSL-3 animal facilities in support of the current and expanded mission requirements of USAMRIID, but it would be contrary to congressional intent for USAMRIID to provide the core of the NIBC. Furthermore, it would not have the potential savings inherent in co-location on the NIBC and it would tend to discourage scientific synergy among researchers from USAMRIID and mission partners.

Although a specific substitute location outside Fort Detrick has not been identified, this alternative would likely result in greater environmental, health, and socioeconomic impacts and higher costs than the other action alternatives. Details of the construction and operation of the proposed new USAMRIID facilities and the decommissioning and demolition and/or re-use of the existing USAMRIID facilities would be essentially the same as those of the other action alternatives, but the specialized supporting infrastructure, logistics, and security requirements available through the NIBC would all have to be provided, in addition to any land acquisition and development costs. Therefore, Alternative V has been rejected as unreasonable, and it will not be evaluated in detail in the EIS.

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## 4.0 AFFECTED ENVIRONMENT

This section of the EIS discusses aspects of the environment that potentially may be impacted by the construction and operation of the proposed new USAMRIID facilities. The following description of the affected environment relies heavily on previous NEPA analyses. Fort Detrick is located in the central portion of Frederick County, Maryland, within the northwest portion of the City of Frederick (see Figure 4-1 and Figure 4-2). Relevant aspects of the affected environment (baseline conditions) are discussed below by environmental attribute area.



**Figure 4-1. Location of Fort Detrick.**

### 4.1 LOCATION AND LAND USE

#### 4.1.1 FREDERICK COUNTY LAND USE

Frederick County is divided into eight planning regions that comprise geographically distinct land areas within the county. The City of Frederick and Fort Detrick are located in the Frederick Region, which is bordered by the Monocacy River to the east, the Catoctin Mountains to the west, Little Hunting Creek to the north, and Ballenger Creek to the south. Land use and development for the county is guided by eight regional plans. Fort Detrick is described in the *Frederick Region Plan*, which provides recommendations for land use through the year 2045 (Frederick County Department of Planning and Zoning, 2002).

Frederick County covers approximately 665 square miles, comprised of 79.7 percent agricultural land/woodland, 10.3 percent residential land, 5.4 percent parkland and open space, 2.5 percent institutional land, 1.3 percent general and limited industrial land, and 0.9 percent commercial land (Frederick County Department of Planning and Zoning, 1998).

#### 4.1.2 CITY OF FREDERICK LAND USE

The City of Frederick covers 20.8 square miles. According to the 2004 *City of Frederick Comprehensive Plan*, land use within the city is distributed as follows: 29 percent is residential, 21 percent is institutional, 8 percent is commercial, 5 percent is industrial, 25 percent is vacant, and the remaining 11 percent includes mixed use, conservation, recreation and rights of way. The City Planning Department has characterized all of Fort Detrick as institutional land. Areas adjacent to Area A of the Installation are predominately zoned as residential. Some of the land

to the west of Area A is zoned as commercial. The land occupied by Frederick Community College (FCC), to the northeast of Area A, is also designated as institutional (City of Frederick, 2004).

#### 4.1.3 FORT DETRICK LAND USE

As an Army installation, Fort Detrick maintains its own land use planning. Although the Installation is located within the city limits of Frederick, local land use regulations are not binding. Land use planning at Fort Detrick is designed to conform and complement local community planning to the maximum extent possible. With its own infrastructure, residential and commuter populations, and community services, Fort Detrick is largely an independent community within the City of Frederick.

Fort Detrick consists of four separate parcels of land (Area A, Area B, and two parcels that make up Area C) covering a total of approximately 1,212 acres, including 69 acres in Area A owned and operated by the NCI-Frederick (see Figure 4-2). (For purposes of this EIS, the Installation is defined as Army-owned land at Fort Detrick which includes Area A, Area B, and Area C. This EIS does not assess the environmental impacts of NCI-Frederick's activities and operations.) Area A of Fort Detrick (approximately 797 acres) is the largest and most intensively developed of the four parcels. It is the location of administrative buildings, community service facilities, recreation areas, advanced research and development complexes, and military and family housing units. Area B (approximately 399 acres) is located west-southwest of Area A and is separated from it by an area of land ranging in width from 0.2 to 1.0 mile. Area B is used for agricultural research, animal grazing and maintenance, U.S. Army Reserve training, Air Force Medical Evaluation Support Activity, a Theater Army Medical Laboratory, and Field Identification of Biological Warfare Agents. Area B contains communication antennas, an indoor shooting range, paintball fields, and a sanitary landfill. According to the *Area B Master Plan EA*, the following land uses are proposed for Area B: 18-hole golf course, recreational vehicle park, and an antenna relocation area (USAG, 2004a). Area C, which is exclusively used for industrial operations, consists of two small tracts located along the west bank of the Monocacy River, approximately 0.8 miles east of Area A. The northern tract of Area C (approximately 7 acres) contains the Fort Detrick WTP. The southern tract (approximately 9 acres) lies ¼ mile downstream from the WTP, and contains the Fort Detrick WWTP (USAG, 1998).

The rapid expansion of Fort Detrick during and following World War II (WWII) strongly influenced existing land use. Facilities constructed at that time were situated based on need, economics, and expediency. Many "temporary" structures constructed during this time period still exist on the Installation. In recent years, many of these facilities have been either upgraded or demolished and replaced with new buildings. Since WWII, land uses typically have been determined according to usage needs, compatibility, and utility support (DA, 1991).

#### 4.1.4 INSTALLATION MASTER PLANNING

In accordance with AR 210-20, *Master Planning for Army Installations* (1993), Fort Detrick maintains an active planning program. Current land use and development at Fort Detrick are described in the *IMP EA for Fort Detrick, Maryland* (USAG, 2003a). The goal of the IMP is to provide a comprehensive plan to direct future development and efficient management of limited resources. In addition to land use, the IMP also addresses areas of concern such as environmental protection, transportation, natural resources, and fire/safety issues. The Land



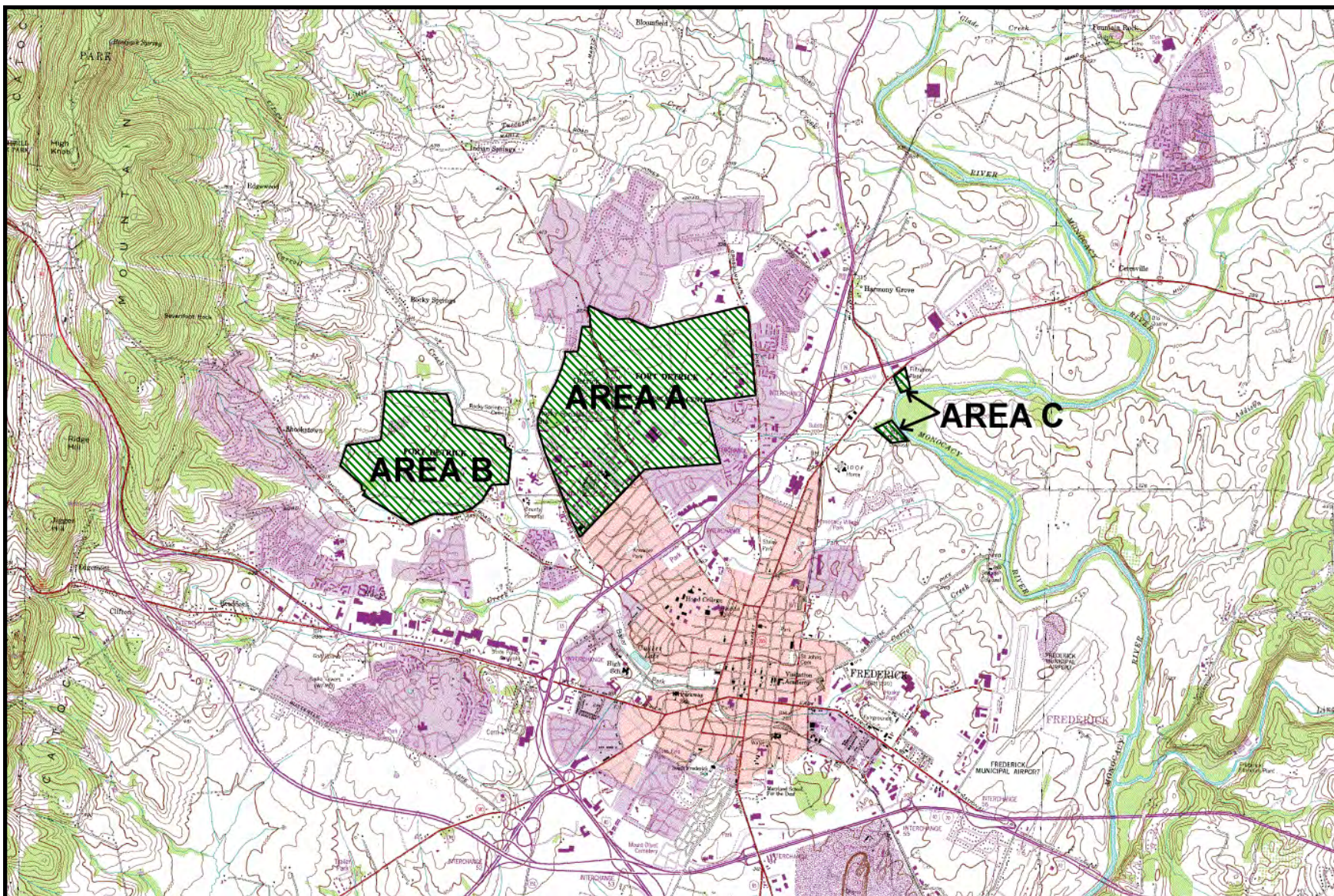


Figure 4-2. Area Location Map of Fort Detrick.



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Use Plan for Fort Detrick was effective April 2003. The siting of the proposed new USAMRIID facilities will be in accordance with the IMP (USAG, 2003a).

Changes in the planning process typically occur with modification to the Army's regulation on Master Planning (AR 210-20). The Installation RPPB advises the Installation Commander on changes to the IMP. AR 210-20 requires that all Army installations maintain a planning board. The Fort Detrick RPPB is comprised of representatives from the command, operational, engineering, and planning divisions of the Installation, as well as the mission partner activities. The Real Property Planning Board, Working Group (RPPB-WG) was recently created to act on behalf of the RPPB to resolve the day-to-day, non-controversial planning issues on the Installation and to advise the RPPB on major decisions.

#### 4.1.5 LAND USE ON AND SURROUNDING THE PROPOSED NEW USAMRIID FACILITIES

USAG has set aside approximately 200 acres on Area A for the NIBC which is located between the densely developed southwestern half of Area A and the largely undeveloped northeastern portion. Specifically, the proposed new USAMRIID facilities will be constructed in two stages on two contiguous parcels of land located within the east-central portion of area A and within the southern portion of the NIBC (see Figure 2-1).

The proposed USAMRIID Stage 1 building footprint occupies 4.5 acres and is located approximately 100 ft. north of the existing primary USAMRIID facility (Building 1425). The proposed USAMRIID Stage 1 site currently consists largely of gravel roadways, buildings, parking lots, and remnant grassland, as well as a row of trees in the southwest corner. A dirt road transects the northern portion of the site, while Sultan Drive and the Building 1432 parking lot occupy the northeastern border area of the site. In addition to the existing primary USAMRIID facility, land use features surrounding the proposed USAMRIID Stage 1 site include the U.S. Army Medical Materiel Agency (USAMMA) / Air Force Medical Logistics Office (AFMLO) / Joint Readiness Clinical Advisory Board (JRCAB) administrative buildings (Buildings 1423 and 1432) directly to the northwest and north respectively, and the USAMRIID Animal Facility (Building 1408) approximately 50 ft. to the west. Construction is currently underway southeast of the site (northeast of Building 1425) on the IRF for NIAID.

The existing primary USAMRIID facility (Building 1425) is the largest USAMRIID facility at Fort Detrick. Building 1425 contains approximately 418,223 ft.<sup>2</sup> of laboratories, administrative offices, and general and hazardous materials storage space (Koning, 2004). Another existing USAMRIID facility (Building 1412) is an approximately 74,000-ft.<sup>2</sup> laboratory located 240 ft. west of the proposed USAMRIID Stage 1 facility site. Building 1412 is primarily used for aerosol testing (USAMRMC, 2001). Buildings 1412 and 1425 were constructed on previously undeveloped land in 1958 and during 1969-1972, respectively (DHS and USAG, 2004a). Located directly southwest of Building 1412 is USAMRIID Building 1414. Originally Building 1414 was an exhaust air incinerator sterilization building associated with Building 1412, but now it is used by USAMRIID to house emergency backup generators and for storage (USAMRMC, 2001).

The proposed USAMRIID Stage 2 building footprint occupies 2.0 acres and adjoins the proposed USAMRIID Stage 1 site to the south. The southern portion of the proposed USAMRIID Stage 2 site currently consists of Building 1423 and the Building 1432 parking lot, while the northern portion of the proposed site consists of relatively flat undeveloped grassland. Land use features surrounding the proposed Stage 2 site include Buildings 1408 and 1412

approximately 350 ft. to the south, USAG computer center (Building 1422) approximately 540 ft. to the southwest, and Building 1432 approximately 90 ft. to the east. Undeveloped grassland is located directly north of the proposed Stage 2 site.

## **4.2 CLIMATE**

Frederick County has a temperate, continental climate with four distinct seasons. Summers are usually short, warm, and occasionally humid. Winters are mostly mild with intermittent periods of cold. Local weather patterns are influenced by the Catoctin Mountains; a north-south trending mountain range located approximately five miles west of Fort Detrick (USAG, 1998). The City of Frederick's annual average temperature is 56.3 °F, with average temperatures of 36.6 °F in the winter and 73.4 °F in the summer, and historical extreme temperatures of -12 °F in the winter and 109 °F in the summer (USAG, 2003a; Maryland State Office of Climatology, 2005). The average annual precipitation for Frederick is 40.8 inches (Maryland State Office of Climatology, 2005). During normal years, precipitation in the region is sufficient to provide an adequate water supply. However, the Central Region of Maryland was in a drought emergency for the greater part of 2002. The resulting Level I and Level II mandatory water usage restrictions were lifted in February 2003. As of 31 October 2005, all hydrologic indicators in the Central Region of Maryland are classified as normal (MDE, 2005a).

The prevailing wind direction for the area is west-southwesterly with an annual average velocity of 7.4 miles per hour. Prevailing winds in the region influence seasonal climatic variations in the Fort Detrick area. In the winter months (October - April), prevailing winds are from the northwest and bring clear, cool weather. During the summer (May - September), a large high-pressure system in the Atlantic Ocean, known as the Bermuda High, frequently influences the region. This system brings warm, moist air into the region from a southwesterly direction (Maryland Office of Environmental Programs, 1986).

The storm events database of the National Climatic Data Center (NCDC) lists the following extreme weather events for Frederick County between 1 January 1950 and 31 July 2005: 10 droughts, 61 floods, 29 hail events, 20 heavy rain events, 65 heavy snow and ice events, 25 lightning events, 179 thunderstorms and high wind events, and 26 tornados (NCDC, 2005).

## **4.3 GEOLOGY**

### **4.3.1 PIEDMONT PLATEAU PHYSIOGRAPHIC PROVINCE**

Fort Detrick lies in the western part of the Piedmont Plateau Physiographic Province (Appalachian Highlands) in a geologic subdivision known as Frederick Valley. The Piedmont Plateau extends from the Fall Line between the Coastal Plain and Piedmont Plateau Physiographic Province in the east to the Catoctin Mountains of the Blue Ridge Physiographic Province in the west. The Piedmont Plateau is characterized by rolling terrain and rather deeply incised stream valleys and comprises approximately 29 percent of Maryland's land area. Frederick Valley trends north to south, extends 26 miles, and is six miles wide. Directly west of Frederick Valley are the Catoctin Mountains. The Frederick Valley is known as the Frederick Syncline, and the Catoctin Mountains are part of an overturned anticline known as the South Mountain Anticlinorium (USACE, 2000b).

**Table 4-1. Current and Future Disposition of Buildings within the Southern Portion of the NIBC.**

Building Number	Year Built	Occupant	Usage			Current GSF	Future GSF
			Past	Current	Future		
1300	2001	USAMRIID	Administrative	Administrative	Administrative	864	864
1301	1956	USDA/USAMRIID	Laboratory	Laboratory	Laboratory	47,801	47,801
1302	1956	USDA	Greenhouse Laboratory	Greenhouse Laboratory	Greenhouse Laboratory	8,750	8,750
1304	1956	USDA	Greenhouse Laboratory	Greenhouse Laboratory	Demolition	3,596	0
1305	1956	USDA	Greenhouse Laboratory	Greenhouse Laboratory	Greenhouse Laboratory	3,596	3,596
1306	1956	USDA	Greenhouse Laboratory	Greenhouse Laboratory	Greenhouse Laboratory	3,596	3,596
1307	1974	USDA	Greenhouse Laboratory	Greenhouse Laboratory	Demolition	320	0
1308	1977	USDA	Storage	Storage	Storage	2,400	2,400
1309	1982	USDA	Greenhouse Laboratory	Greenhouse Laboratory	Greenhouse Laboratory	2,024	2,024
1312	1957	USDA	Greenhouse Laboratory	Greenhouse Laboratory	Greenhouse Laboratory	364	364
1313	1973	USDA	Storage	Storage	Storage	800	800
1315	1965	USDA	Greenhouse Laboratory	Greenhouse Laboratory	Greenhouse Laboratory	230	230
1316	1957	USDA	Storage	Storage	Demolition	800	0
1408	2003	USAMRIID	Animal Facility	Animal Facility	Demolition	16,340	0
1412	1958	USAMRIID	Laboratory	Laboratory	Demolition	73,920	0
1414	1958	USAMRIID	Air Incinerator	Storage	Demolition	2,643	0
1415	1959	Union	Access Control Facility (Guard Shack)	Union Office	Demolition	139	0

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**Table 4-1. Current and Future Disposition of Buildings within the Southern Portion of the NIBC (continued).**

Building Number	Year Built	Occupant	Usage			Current GSF	Future GSF
			Past	Current	Future		
1420	1997	USAG, DOIM	Standby Generator	Standby Generator	May Be Demolished	728	728
1422	1963	USAG, DOIM	Computer Center	Computer Center	May Be Demolished	25,162	25,162
1423	1987	USAMMA/AFMLO/JRCAB	Administrative	Administrative	Demolition	41,812	0
1425	1969	USAMRIID	Laboratory	Laboratory	Partial Demolition or Re-use	426,023	213,012*
1432	1994	USAMMA/AFMLO	Administrative	Administrative	Demolition	12,480	0
1433	2002	Trailer being leased by IBM as part of a USAMMA contract	Administrative	Administrative	Removal at end of USAMMA contract with IBM	2,867	0
1436	1998	USAMRIID/USAMRMC	Administrative	Administrative	Demolition	6,780	0
1438	2002	USAMRIID	Storage	Storage	Demolition	10,000	0
<b>TOTAL</b>						<b>694,035</b>	<b>309,327</b>

Source: Federline, 2006.

\*Assumes approximately one-half of Building 1425 is retained.

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The Piedmont Plateau ranges in elevation from approximately 100 ft. to 1,000 ft. above sea level (MDNR, 1999). Elevations at Fort Detrick range from 320 ft. to more than 400 ft. above sea level. The elevations for the proposed USAMRIID sites range from 356 ft. to 362 ft. above sea level for Stage 1 to 362 ft. to 370 ft. above sea level for Stage 2. Each of the proposed USAMRIID sites slope from northwest to southeast (U.S. Geological Survey [USGS], 1993).

#### 4.3.2 REGIONAL GEOLOGY

The regional geology underlying Area A is the fractured limestone and dolomite of the Upper Cambrian Frederick Formation, which consists of the Lime Kiln, Rocky Springs Station, and Adamstown members (see Figure 4-3). The Frederick Formation has been known to develop karst features such as sinkholes. Specifically, Area A is bisected by the contact between the Rocky Springs Station Member (western portion) and the Adamstown Member (eastern portion). The locations for the proposed new USAMRIID facilities are underlain by the Adamstown Member, a fine-grained, thin-bedded, dark gray limestone containing several traceable breccia stones. The northwestern portion of the NIBC (i.e., Buildings 1300-1313) is underlain by the Rocky Springs Station Member, a thinly-bedded limestone containing dolomite and layers of coarse quartz sand (USAG, 2003a).

#### 4.3.3 SINKHOLES AND DEPRESSIONS

Sinkholes are known to develop in the Frederick Formation. These circular depressions in the landscape are created when groundwater dissolves underlying limestone and the resulting cavity collapses. The potential for the formation of sinkholes increases in response to unnatural surface loading (e.g., building construction and stormwater retention) on enclosed topographic depressions (USAG, 2003a). Also, because sinkholes can accelerate surface water and contaminant entry into an aquifer, they can become gateways for groundwater contamination (USACE, 2002a). A preliminary geotechnical study, dated 4 March 2003, was performed at the NIBC in support of the USAMRIID FS. A total of 17 soil borings that were drilled as part of the investigation confirmed that no sinkholes are present at the proposed locations of the USAMRIID Stage 1 and Stage 2 sites and no groundwater was encountered during the study (USAMRIID, 2003). Although no known sinkholes are present on the proposed new USAMRIID sites, the possibility remains of encountering heretofore-unknown cavities beneath the sites. The sites for the proposed new USAMRIID facilities are underlain by a combination of geological (Adamstown) and soil (Duffield) units that create a moderate potential for sinkhole development (USDA, 2002). A study completed by the MDNR in 2004 concluded that both Rocky Springs Station and Adamstown members have a very low occurrence active sinkholes. The bulk of both units are characterized by thin-bedded, shaly limestones which have few joints but abundant argillaceous layers. The argillaceous layers absorb strain during folding of the units, exhibiting fewer brittle fractures, and produce clay that dissolves, impeding water movement (Brezinski, 2004).

Based on previous interpretation of aerial photographs and USGS quadrangle maps for topographic characteristics, vegetation, and soil tone, several sinkholes/depressions have been identified on or near Area A of Fort Detrick (see Figure 4-4). None of these sinkholes are located at the sites of the proposed new USAMRIID facilities. The closest sinkhole to the proposed USAMRIID Stage 1 site is located approximately 800 ft. to the northwest and covers an area of approximately 2.7 acres (115,720 ft.<sup>2</sup>) (USACE, 2001). This sinkhole is approximately 540 ft. to the northwest of the proposed USAMRIID Stage 2 site.

#### 4.3.4 FRACTURE TRACES AND LINEAMENTS

Fracture traces and lineaments are linear features that may suggest the presence of natural, geologic features, such as faults and joints; or they may reflect man-made structures, such as fence lines, or drainage ditches (see Figure 4-4; USACE, 2001). Subterranean fracture traces that are connected to the aquifer may represent pathways for groundwater flow and influence the regional groundwater flow regime (USACE, 2002a).

Photogeologic analysis of Area A did not identify any fracture traces in the vicinity of the two proposed sites for the new USAMRIID facilities. However, several fracture traces are located within close proximity to the proposed sites. The fracture trace that is located closest to the two proposed USAMRIID facility sites is approximately 630 ft. long and runs west to east directly under the NBACC Facility site. The fracture trace terminates approximately 100 ft. east of the northeast boundary of the proposed USAMRIID Stage 1 site. The fracture trace is located approximately 220 ft. east of the proposed USAMRIID Stage 2 site. A second fracture trace located in the vicinity of the proposed USAMRIID facility sites runs 1,600 ft. long in a zigzag pattern, originates southeast of the Barracks, crosses Porter Street, transects Building 1434, and runs beneath the central portion of the planned NBACC Facility/NIAID IRF parking lot (USACE, 2001).

#### 4.3.5 SEISMIC CONDITIONS

Fort Detrick is located within a Seismic Zone 1 area with seismic coefficients ranging from 0.03 to 0.07. Seismic coefficients, in general, range from 0.0 to 0.27, with high values indicating high risk of earthquake. Seismic Zone 1 is characterized as an area that may receive minor damage due to distant earthquakes (USAG, 2003a). Nearly all of Maryland, including Frederick County, is classified as a "region of negligible seismicity with very low probability of collapse of the structure." Between 1758 and 2005, 62 earthquakes occurred in the State of Maryland (Maryland Geological Survey, 2005). The design of the new USAMRIID facilities will incorporate seismic considerations appropriate to Seismic Zone 1 and Use Group requirements.

#### 4.4 SOILS

The soils of Frederick County consist of a combination of residual lime soils and wind-transported soils, and they are among the most agriculturally productive in the State of Maryland. Duffield series soils are found extensively throughout the Frederick Valley (USACE, 2000b). The subsurface material in Area A at Fort Detrick is predominantly a reddish-brown sandy clay underlain by a hard limestone which is medium to dark gray in color (Soil Conservation Service, 1956). Duffield soils, predominantly silt loams, are present throughout the majority of the NIBC, including the sites for the proposed new USAMRIID facilities (see Figure 4-5). The Duffield series consists of very deep, well-drained soils with moderate permeability. Available water capacity for the Duffield series soils is low to moderate. The Duffield soils throughout the central portion of the NIBC are characteristic of karst landscapes with a potential for moderate sinkhole development, as discussed in Section 4.3.3 (USDA, 2002).

In addition to Duffield soils, urban land is present on the northern and northeastern boundary of the proposed USAMRIID Stage 1 site and the southern half of the proposed USAMRIID Stage 2 site. Urban land is defined as areas that have been smoothed and where the original soil has been disturbed, filled over, or otherwise destroyed prior to construction, with 90 percent of the

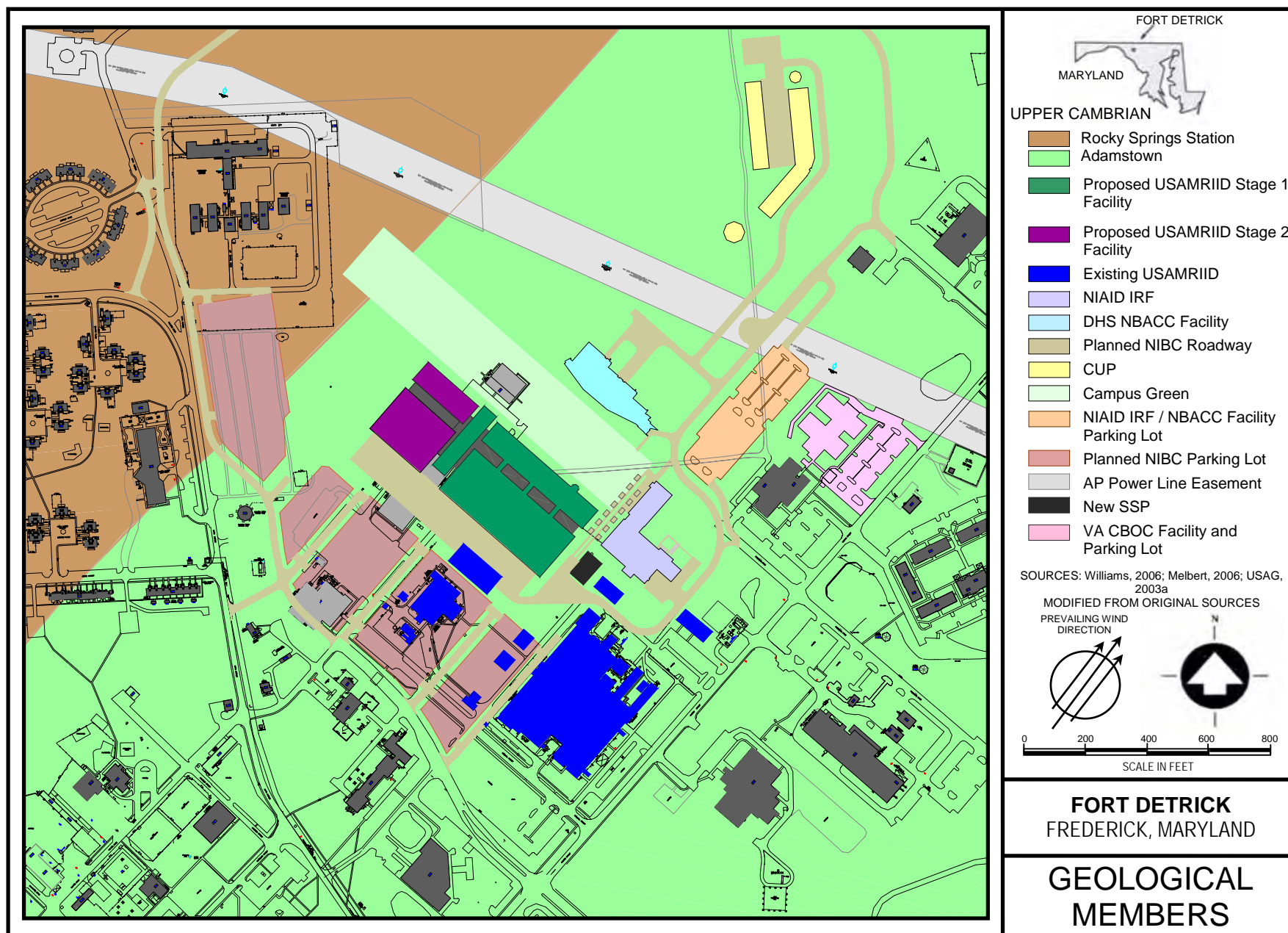
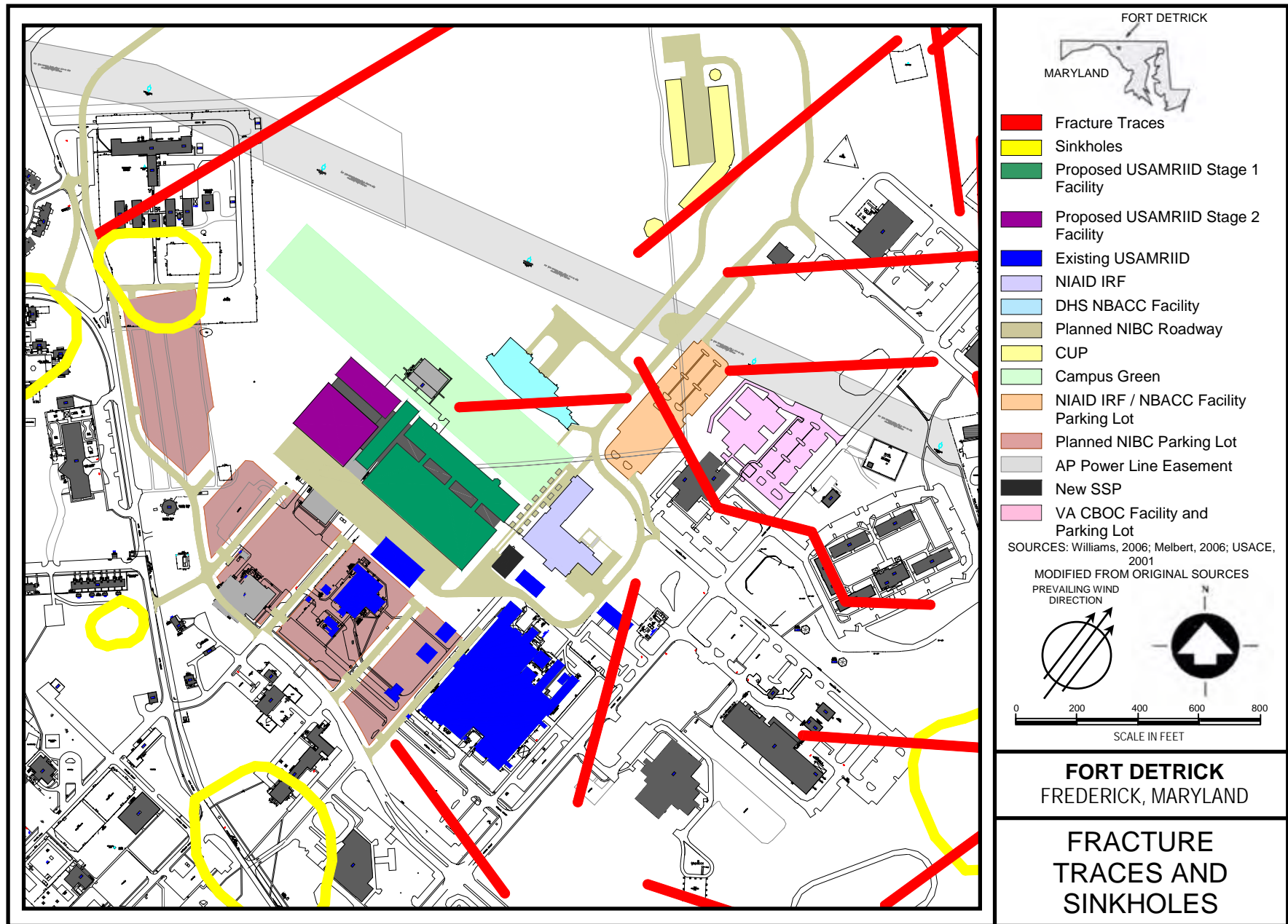


Figure 4-3. Geological Members on the Site of the Proposed New USAMRIID Facilities.

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**Figure 4-4. Fracture Traces and Sinkholes Near the Site of the Proposed New USAMRIID Facilities.**

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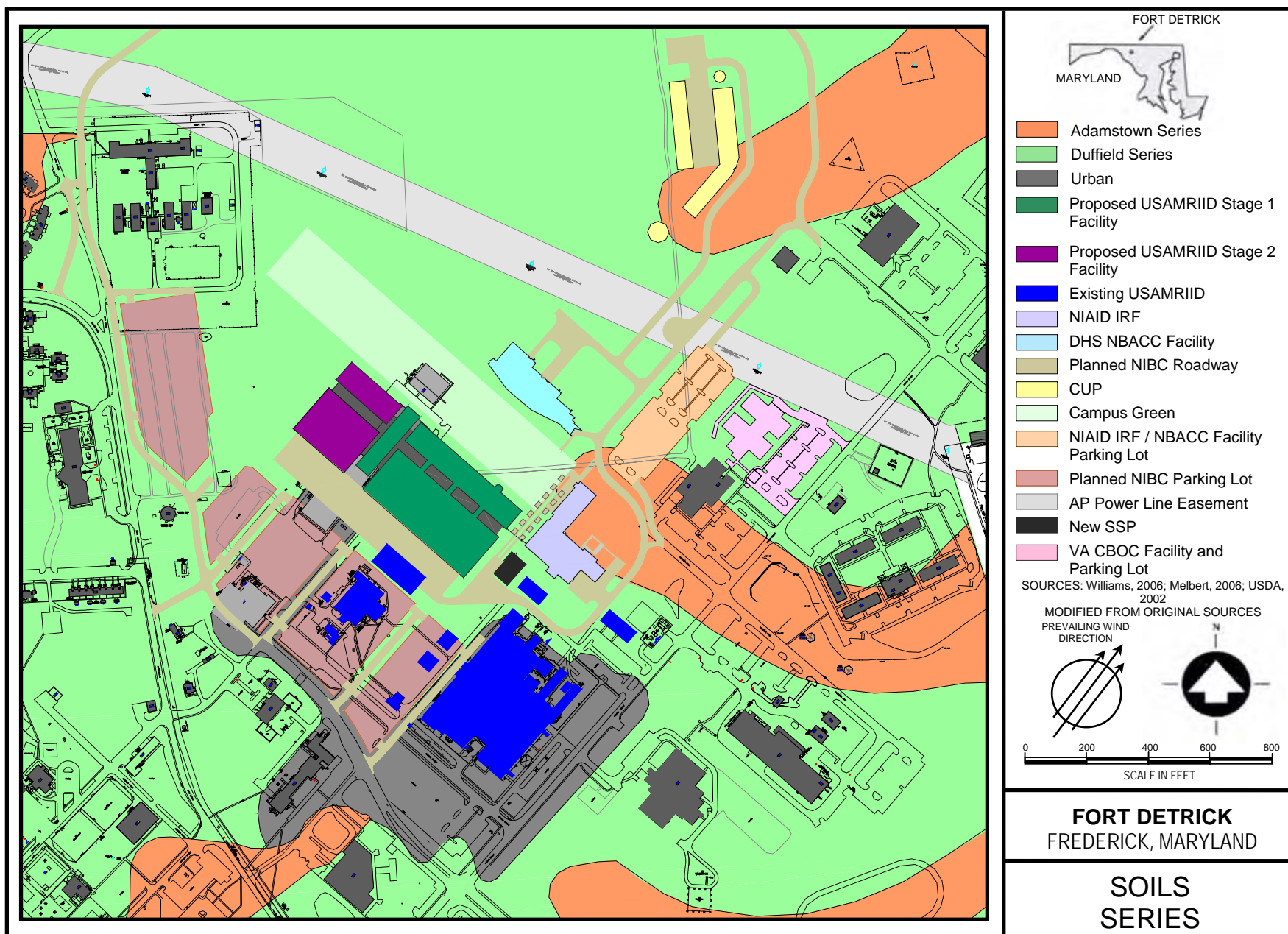


Figure 4-5. Soils Series on the Site of the Proposed New USAMRIID Facilities.

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surface covered by asphalt, concrete, or other impervious material that supports little or no vegetation (USDA, 2002).

## **4.5 WATER RESOURCES**

### **4.5.1 SURFACE WATER**

Fort Detrick is located within the Monocacy River drainage basin, a sub-basin of the Middle Potomac River Basin, which covers approximately 986 square miles (USEPA, 2005a). Approximately 75 percent of this watershed area is located within the State of Maryland, with the remainder in Pennsylvania. The land use in the Monocacy River Basin is predominately agricultural, with remaining land uses in the watershed including forests, the City of Frederick, and residential neighborhoods (Alliance for the Chesapeake Bay, Inc., 2006).

The Monocacy River ranges from 40 ft. to 375 ft. in width and from 0.5 ft. to 18 ft. in depth. This major stream originates at the Maryland-Pennsylvania border and flows south, passing Fort Detrick and the City of Frederick to the east. The Monocacy River joins the Potomac River approximately 15 miles south of the City of Frederick and eventually discharges into the Chesapeake Bay. Area A of Fort Detrick is located approximately 1.5 miles to the west of the Monocacy River (DHS and USAG, 2004a).

Stream discharge rates of the Monocacy River near Fort Detrick are obtained from measurements collected at the Jug Bridge gauging station, located approximately five miles southeast of Area A (USGS, 2000). This station drains approximately 817 square miles of the watershed above the City of Frederick (USGS, 2005). Based on 75 years of record (1929 to 2003), daily mean flow recorded at this station has ranged from a minimum of 19 cubic feet per second (cfs) (12 mgd) to a maximum of 73,873 cfs (47,742 mgd). The average annual streamflow for this period of record was 938 cfs (606 mgd) (USGS, 2003). During this period of record, the maximum instantaneous discharge of 81,600 cfs (52,645 mgd) occurred on 23 June 1972, and the minimum instantaneous discharge of 17 cfs (11 mgd) took place on 11 and 13 September 1966 (USGS, 2005). The flood threshold at the Jug Bridge gauging station corresponds to a discharge of approximately 15,500 cfs (10,000 mgd); therefore, flood events are not uncommon (USGS, 2000; National Weather Service, 2002).

The Monocacy River is used as a source for drinking water, and it is also used for agricultural irrigation, boating, canoeing, and recreational fishing. It is a warmwater fishery and has been classified by the State of Maryland as Recreational Trout Waters and Public Water Supply (Use IV-P; COMAR 26.08.02). Use IV-P waters are managed as special fisheries by periodic stocking and seasonal catching and have the potential for supporting adult trout populations for put-and-take fishing. Tributaries to the Monocacy River that are not designated Use IV-P are designated as Use III-P (Natural Trout Waters and Public Water Supply). These tributaries must maintain water quality standards that ensure the growth and propagation of self-sustaining trout populations and their associated food organisms. Use III-P tributaries must provide a safe and effective public water supply source. Carroll Creek, the major tributary to the Monocacy River in the vicinity of Frederick, is classified for Use III-P. This creek originates in the wooded uplands of the Catoctin Mountains (1.8 to 2.0 miles west of Frederick), flows southward between Area A and Area B, and discharges into the Monocacy River (USAG, 2003a).

The Monocacy River is a water supply source for both the City of Frederick and Fort Detrick (see Section 4.5.4). The City of Frederick draws approximately 28.5 percent of its drinking water

(an average of 1.80 mgd) from the Monocacy River (Lambert, 2005; City of Frederick, 2005). Fort Detrick relies on the Monocacy River as its sole source for drinking water<sup>4</sup> and currently withdraws water at an average rate of about 1.23 mgd (Lewis, 2005a; 2005b). The Installation's WTP holds MDE Water Allocation Permit FR43S001(02), which authorizes withdrawal of water from the Monocacy River at rates up to a daily average of 2.0 mgd or 2.5 mgd daily maximum. This permit expires in 2012 (USAG, 2003a). The Monocacy River has the highest consumptive use in the Potomac River Basin. Fort Detrick has an excellent record of meeting water quality standards, as set by Federal (*Clean Water Act*), state (COMAR 26.04.01), and DA criteria (Lewis, 2005a). The anticipated consumption of water by the proposed new USAMRIID facilities is likely to be a minor portion of the total water consumption of the Installation.

In 2002, Frederick County, as well as the State of Maryland, experienced the worst drought conditions since the 1930s (The Gazette, 2002). The highest mean monthly streamflow for the Monocacy River in CY 2000, the last year before the drought, was 2,033 cfs (1,314 mgd) in March, and the lowest mean monthly streamflow was 275 cfs (177 mgd) in October (USGS, 2002). By contrast, the CY 2002 streamflow ranged from the highest mean monthly streamflow of 1,752 cfs (1,132 mgd) in December to the lowest mean monthly streamflow of 62 cfs (40 mgd) in August (USGS, 2003). Level One Mandatory Water Use Restrictions were implemented after emergency drought conditions were declared by former Governor Parris N. Glendening (MDE, 2003a). Restrictions included prohibitions on the use of water for residential landscaping, washing of paved surfaces, non-recycling water ornamental fountains, washing of vehicles, as well as unsolicited service of tap water in food service establishments. On 20 February 2003, the drought emergency in the central region of Maryland, including Frederick County, was lifted, removing Level One Mandatory Water Use Restrictions (MDE, 2003a).

Primary surface water features in Area A include the 3.3-acre Nallin Farm Pond and two tributaries of the Monocacy River. The Nallin Farm Pond, which is located approximately 3,200 ft. northeast of the proposed new USAMRIID facilities, was formed by the diking of natural springs (USAG, 2003a). A permit issued by the MDE to use the Nallin Farm Pond for emergency consumptive uses (Water Appropriation and Use Permit FR43S101(01)) was inactivated on 24 April 2000. However, Fort Detrick can use the Nallin Farm Pond for emergency firefighting purposes, which does not require a permit (DHS and USAG, 2004a).

One of the aforementioned tributaries of the Monocacy River, Tributary #10 (Two Mile Run), extends south from the Nallin Farm Pond, then flows east, exiting the eastern portion of Area A at Outfall A-6 and discharging into the Monocacy River approximately one mile east of Area A (DA, DIS, 2001). This stream formerly originated on the FCC property. It entered the north-central boundary of Area A, flowing southeastward, then it turned toward the south and discharged into the Nallin Farm Pond. During a site visit conducted in April 2002, the upper stretch of the tributary was not seen. Agricultural activities involving the plowing and cutting of grass for hay bales may have contributed to the absence of this tributary (DHS and USAG, 2004a). Currently, Tributary #10 has a drainage area of approximately 0.38 square miles (243 acres), and three tributaries, named 10A, 10B, and 10C that confluence with it at points east of Nallin Farm Pond. Tributary #10 and its tributaries are all clearly defined channels with running water (USACE, 2005b).

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<sup>4</sup> Fort Detrick has a mutual agreement with the City of Frederick to provide water in the event of an emergency. The City's water supply sources include groundwater and Lake Linganore in addition to the Monocacy River.

Tributary #9 (Detrick Branch) originates in the south-central portion of Area A, just south of Building 1434. The small stream flows east through a swale that runs adjacent to a stormwater retention basin, located immediately south of the unaccompanied enlisted personnel housing (UEPH), and from there it flows to the southeastern boundary of the Installation. The tributary exits Area A at Outfall A-4 and discharges into the Monocacy River approximately one mile east of Area A (DHS and USAG, 2004a). Currently, there is significant construction, including widespread stormwater routing changes, in the area adjacent to Tributary #9 (USACE, 2005b).

In total, there are eight distinct and separate surface water outfalls that drain from Area A. Four of these outfalls (A-1, A-2, A-7, and A-8) drain toward Carroll Creek. The other four outfalls (A-3, A-4, A-5, and A-6) drain toward the Monocacy River (General Physics, 2004; USAG, 2005b).

The stormwater retention pond adjacent to Building 1434 was built during 1998 and 1999, and has since been modified several times (see Section 4.5.3; DHS and USAG, 2004b). The developers of the NIAID IRF are in the process of enlarging and reconfiguring the retention pond to make it the primary stormwater quantity and quality management feature for the NIAID IRF and its associated parking lot (DHS and USAG, 2004a). The retention pond will also service the new SSP.

#### 4.5.2 GROUNDWATER

The Frederick area of the Piedmont Plateau Physiographic Province has the most productive hard rock aquifers within the State of Maryland. These aquifers have generally good water quality, and approximately 20 percent of these formations have the potential to yield at least 50 gpm of water (Maryland Office of Environmental Programs, 1986). Groundwater is transported through the carbonate aquifers via bedding planes, fractures, joints, faults, and other partings that have been enlarged by the dissolution of the carbonate bedrock (Trapp and Horn, 1997). The Fort Detrick Photogeologic Analysis (USACE, 2001) indicates numerous fracture traces and lineament features on Area A that could serve as potential conduits for groundwater contamination (see Section 4.3.4; Maryland Office of Environmental Programs, 1986). Groundwater underlying the Fort Detrick area flows generally to the southeast, towards the Monocacy River (USACE, 2000b).

Wells in the Frederick Limestone typically yield 120 to 170 gpm (Trapp and Horn, 1997). Portions of the aquifer underlying Area A have been compromised by three sources of groundwater contamination. These sources include underground gasoline storage tank leaks near Building 950 (located approximately 1,700 ft. to the southwest of the proposed new USAMRIID facilities), a trichloroethylene (TCE) spill near Building 568 (located approximately 2,300 ft. to the southwest), and a No. 6 fuel oil plume near Building 190 (located approximately 3,700 ft. to the southwest). However, groundwater underlying Area A is not used for human consumption. Fort Detrick residents and workers obtain their drinking water from the Monocacy River (USACE, 2000b).

Groundwater in the areas of groundwater contamination noted above flows in a southwesterly direction. Thus, based on the groundwater flow direction in this area, in addition to the long distances that would be involved, suggests that contaminated water has not, and likely will not, migrate onto the site of the proposed new USAMRIID facilities. Therefore, groundwater at the site of the proposed new USAMRIID facilities will not pose a health risk to workers during the construction and operational phases (USACE, 2000b).

In accordance with MDE Permit No. FR1943G101(05), Fort Detrick may withdraw an annual daily average of 9,000 gallons of groundwater and 9,500 gallons per day for the month of maximum use from one well near Building 568. Actual withdrawal rates are below this limit (Gortva, 2006). Groundwater withdrawn from this well is treated to remove TCE and utilized for research purposes by U.S. Army Center for Environmental Health Research laboratories (USAG, 2003a). The remedial investigation (RI) and required response actions for the Building 568 TCE spill site are completed; however, long-term groundwater monitoring is to continue at this location (DHS and USAG, 2004a). For a more detailed description of the contamination present at Fort Detrick and the remedial steps being taken by the DA see Section 4.17.1. A groundwater pump near Building 350 is used to lower the shallow groundwater in the area. Water from this pump is discharged into the sanitary sewer system. A detailed discussion of this groundwater pump is presented in Section 4.15.1.1.

#### 4.5.3 STORMWATER

Fort Detrick is permitted to discharge stormwater runoff from land used for industrial operations in accordance with State Discharge Permit No. 02-SW-0124. This permit prohibits the discharge of non-stormwater into surface waters, requires annual site compliance evaluations, and mandates maintenance of a Stormwater Pollution Prevention Plan (SWPPP). Sampling of stormwater is not required; however, sampling may be conducted as a proactive measure. Fort Detrick's SWPPP identifies potential sources of pollution associated with industrial activity on the Installation and outlines BMPs to minimize potential contamination of stormwater exiting Fort Detrick (USAG, 2003b).

The majority of the stormwater in Area A is diverted through a system of surface ditches, inlets, culverts, and storm sewer lines as it drains into Carroll Creek and two other tributaries of the Monocacy River (i.e., Tributaries #9 and #10). In general, stormwater from the central and western portions of Area A drains west into Carroll Creek. Stormwater from the eastern portion of Area A generally drains east into other tributaries of the Monocacy River (USGS, 1993; DA, DIS, 2001). The sites of the proposed new USAMRIID facilities lie approximately 3,200 ft. southwest of the nearest 100-year floodplain (USACE, 2005b). See Section 4.6 for an expanded discussion of floodplains at Fort Detrick.

Presently, most stormwater runoff from the southern portion of the NIBC, where the proposed new USAMRIID facilities will be located, drains towards Building 1434 and into a small dry retention pond located between Building 1434 and Porter Street. From the dry retention pond, water flows through an outfall culvert under Porter Street into a swale located south of Porter Street, which discharges into the new UEPH stormwater management pond. The UEPH pond will serve as the regional stormwater pond for the southern portion of the NIBC. Water exits the UEPH pond through Outfall A-4, which leads to Tributary #9 (USAG, 2005b).

The remainder of the stormwater runoff on the southern portion of the NIBC flows from the site of the NIAID IRF into the small stormwater retention pond located between Building 1434 and Porter Street (see Figure 4-6). This retention pond was built during 1998 and 1999, but it has since been modified several times. Additionally, stormwater runoff from the site of the new SSP will be directed towards this retention pond.

In accordance with 40 CFR 122.26 and COMAR 26.17.02, construction projects that disturb more than 5,000 ft.<sup>2</sup> of land require a general NPDES permit that authorizes discharge of pollutants in stormwater during the construction period. USAG DIS and each mission partner of

USAG on the NIBC must ensure that appropriate stormwater management and sedimentation and erosion control measures are implemented. The current stormwater management system in this part of Area A is adequate for present environmental conditions. However, it will be upgraded since the proposed new USAMRIID facilities and associated structures will increase the amount of impervious surface area on this part of the Installation. As part of the *Fort Detrick Stormwater Institutional Management Plan for Drainage Areas A-3 and A-4*, runoff from the site of the proposed new USAMRIID facilities that flows to the UEPH pond will be diverted to a regional stormwater management pond which will be established west of the A-3 outfall (located south of Porter Street). This regional stormwater management pond will allow Outfall A-3 to supplement the capacity of Outfall A-4 (USAG, 2005b).

Additionally, LID sustainability features for stormwater management will be incorporated into the design of the proposed new USAMRIID facilities to the maximum practical extent.

#### 4.5.4 DRINKING WATER

##### 4.5.4.1 Source Water

Fort Detrick owns, operates, and maintains the Installation water distribution system. Source water is withdrawn from the Monocacy River and is processed through the Fort Detrick WTP located in Area C, approximately 1.5 miles to the east of Area A. The WTP has a maximum processing capacity of 4.25 mgd, but due to the size of the existing distribution pipes, the WTP can only provide a maximum of 3.1 mgd of finished water without exceeding the maximum pressure for distribution (Lewis, 2005a; DHS and USAG, 2004a). However, the Installation is limited to a maximum daily withdrawal of 2.5 mgd. The MDE Water Management Administration has authorized Fort Detrick to withdraw a daily average of 2.0 mgd of water with a maximum daily withdrawal of 2.5 mgd from the Monocacy River under Water Appropriation and Use Permit No. FR43S001(02). This water allocation permit expires in 2012 (USAG, 2003a).

Water obtained in accordance with this permit is utilized as potable water, cooling water, and for sanitary facilities at Fort Detrick. Fort Detrick relies on the Monocacy River as its primary source for drinking water; however, in cases of emergency or if a plant is shut down for repair, Fort Detrick and the City of Frederick exchange water between their water distribution systems through a manual metered connection on Area A (see Section 4.5.4.3; DHS and USAG, 2004a). The WTP produced approximately 493 million gallons of water in FY 2003, approximately 567 million gallons of water in FY 2004, and approximately 449 million gallons of water in FY 2005 (see Table 4-3). Based on FY 2005 data, the Fort Detrick WTP currently produces finished water at a rate of 1.23 mgd (Lewis, 2005a; 2005b; Lewis, 2006a). The existing USAMRIID facilities currently consume approximately 6.7 percent of the water produced by the WTP (Potter, 2005a). The WTP utilizes conventional treatment processes, and it is staffed and operated 24 hours a day (DHS and USAG, 2004a). Fort Detrick has an excellent record of meeting water quality standards, as set by Federal (Clean Water Act), state (COMAR 26.04.01), and DA criteria (Lewis, 2005a).

A study is being prepared for USAG that will evaluate water supply capacity issues and potential supply alternatives at the Installation. The study will identify potential alternative sources of water that would augment production at the WTP, which may reach its production capacity as a result of projected future development at the Installation.

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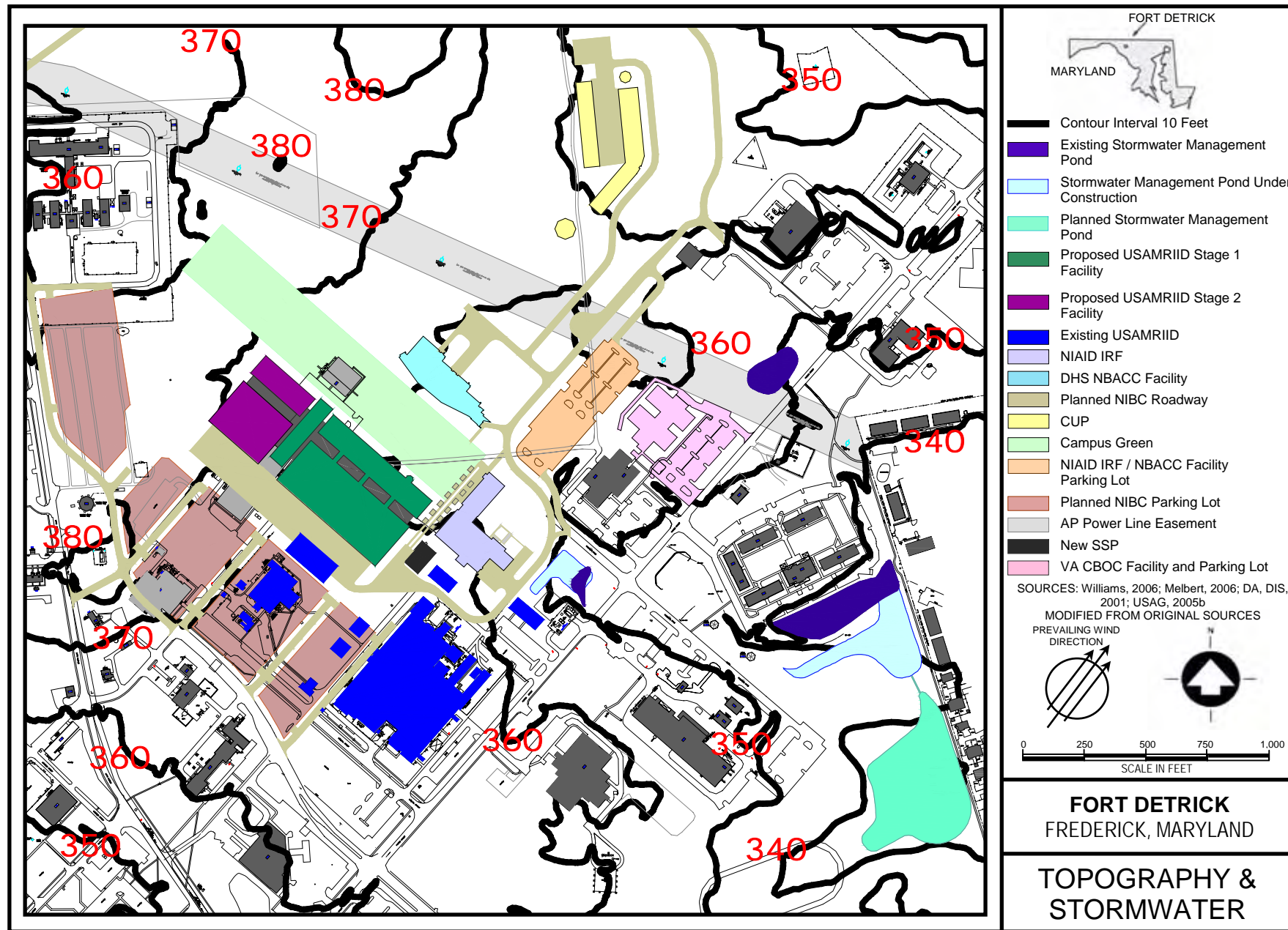


Figure 4-6. Topography and Stormwater Management Ponds for the Site of the Proposed New USAMRIID Facilities.

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One option that Fort Detrick may have to satisfy its future water requirements is via connection to the Potomac River pipeline that Frederick County is constructing to meet the increasing needs of the County and City for drinking water. The Frederick County Division of Utilities and Solid Waste Management commissioned a water alignment engineering study (Whitman, Requart and Associates, 2006) in order to assess the different options for interconnecting Fort Detrick to the Potomac River pipeline. The study evaluated four potential alternative routes that such an alignment might take from the Frederick County water system to the Fort Detrick water system. The study recommended an alternative that would run the alignment primarily along rights-of-way that parallel routes US 15/US 40 and the Frederick Freeway up to the Installation. The advantages of this alternative would be to reduce impacts to residential areas, minimize permitting requirements, and the presence of wide rights-of-way. In addition, this alternative is the most direct route to the Installation.

One valid alternative that the engineering report did identify but did not analyze in detail would be to use existing County and City infrastructure to transfer water to the Installation. Water would be transferred from the County system through the City's existing system and connect with Fort Detrick's water system at the existing City-Installation connection point near Seventh Street (Whitman, Requart and Associates, 2006). Officials from the County, City and Fort Detrick have agreed to prepare a study in order to assess the feasibility of this option (Craig, 2006a).

#### *4.5.4.2 Water Treatment*

Source water is filtered and processed by prechlorination, chemical addition with flash mixing, filtration, sedimentation, and flocculation. Chemicals added during treatment include chlorine for disinfection, activated carbon for taste and odor control, lime for pH control, and aluminum sulfate and sodium aluminate for flocculation. Water is currently chlorinated to 1.5 to 1.8 ppm of free residual chlorine prior to distribution (see Table 4-2). Polymer is added to the drinking water in the winter months (DHS and USAG, 2004a). Sludge generated at the WTP is currently disposed by land application in Area B. The WTP sludge is certified as a soil conditioner by the Maryland Department of Agriculture, which allows for the land application of the accumulated sludge (Lewis, 2006a).

Source water from the Monocacy River is first processed through a purity testing tank using bluegill sunfish as biomonitors of the quality of the intake water. The biomonitoring system continuously monitors the respiratory behavior and movement of fish. In May 2004, the Fort Detrick WTP noted deaths of some of the bluegill sunfish from the source (intake) water and alerted the City of Frederick WTP which lies immediately upstream of the Fort Detrick WTP. The City of Frederick WTP was shut down for 48 hours as a precaution. The contaminant in the Monocacy River was determined to be butyl carbitol acetate. MDE indicated there were no reports of fish kills on the Monocacy River during this time period. SOPs for raw water intake/polished water monitoring have been established for use in the event of future biomonitoring distress or mortality (Lewis, 2006b).

Treated water exits from the system through four pipes, which merge into two 12-inch pipes. Subsequently, the water flows into one 16-inch pipe to the lime building where the water is chlorinated and lime is added to adjust pH. The pH of treated water is maintained at about 7.7. Finished water flows into the two clear wells with a 500,000-gallon capacity. The clear wells allow for sufficient contact time for disinfection during chlorination (DHS and USAG, 2004a).

Disinfected water is pumped into the water distribution system (DHS and USAG, 2004a). Treated water is used for human consumption, process water, irrigation, and fire protection. The FY 2005 average monthly water production at Fort Detrick was approximately 37.3 million gallons (see Table 4-3; Potter, 2005a). Fort Detrick is currently conducting a Cross Connection Control Survey to identify and categorize all backflow prevention devices located on the Installation (Lewis, 2006a).

**Table 4-2. Annual Chemical Additives (in pounds) During Water Treatment.**

Chemical	2002	2003	2004	2005
Aluminum sulfate	192,588	170,868	184,601	135,855
Sodium aluminate	32,400	46,776	39,904	23,905
Activated carbon	19,152	22,044	18,942	16,588
Lime	51,900	45,348	48,450	40,700
Chlorine	21,144	20,328	20,467	16,566
Polymer	390	276	361	220
Fluoride <sup>1</sup>	N/A	N/A	N/A	7,967

<sup>1</sup> The WTP began adding fluorosilicic acid for fluoridation in March 2005.

Source: Lewis, 2006c; Lewis, 2005a; DHS and USAG, 2004a.

**Table 4-3. Fort Detrick Total Water Production and Sewage Generation.**

Water/Sewage	FY 2002	FY 2003	FY 2004	FY 2005
Water Produced (gallons)	462,717,000	492,170,000	566,655,000	449,825,000
Sewage Generated <sup>1</sup> (gallons)	267,761,000	371,544,000	358,854,000	250,610,000

<sup>1</sup> Data includes sanitary and contaminated wastewater.

Source: Lewis, 2006a.

A fluoridation system was activated at the WTP on 16 March 2005 after approval was obtained from the MDE. An EA concluded that fluoride would be beneficial as a preventative tooth decay measure if added to the drinking water on Fort Detrick (USAG, 2002a). The drinking water supply at Fort Detrick is fluoridated at a concentration of 0.9 ppm, utilizing the addition of hydrofluosilicic acid (Lewis, 2005a; USAG, 2002a). The background level of fluoride in the Monocacy River is approximately 0.2 ppm (DHS and USAG, 2004a).

#### 4.5.4.3 Water Distribution System

Fort Detrick and the City of Frederick have a written agreement for the exchange of potable water. In cases of emergency or if a plant is shut down for repair, Fort Detrick and Frederick exchange water between their water distribution systems through a metered manual connection on Area A (Lewis, 2006a). The City of Frederick water intake is approximately 75 yards upstream from the Fort Detrick intake. (DHS and USAG, 2004a). The City of Frederick uses approximately 6.3 million gallons of water per day, with 68 percent consumed by residential uses and 32 percent by commercial, industrial, and other uses (Frederick News-Post, 2005a). The City of Frederick pumps approximately 29.3 percent of its drinking water from the Monocacy River. The City of Frederick fluoridates their drinking water supply to a level of 0.95 to 1.2 ppm using 23 to 25 percent hydrofluosilicic acid (Lambert, 2005).

Limitations of the water supply system to support increased demands from Fort Detrick are: (1) the production capacity of the WTP; (2) line pressure and pipe size; (3) the volume of water available from the Monocacy River; and (4) the availability of source water during drought conditions (DHS and USAG, 2004a). The production capacity of the WTP is 4.25 mgd of finished water; however, Fort Detrick currently consumes about 1.23 mgd, as discussed in Section 4.5.4.1 (Lewis, 2005a; 2005b). Although there is ample capacity at the WTP, the size of the existing pipes and the lack of water pressure in the distribution system are potential weaknesses of the system (DHS and USAG, 2004a). In addition, the majority of the water distribution system is more than 40 years old, and it will likely require increased maintenance and repair in order to maintain its integrity. On 27 July 2005, the main line conveying water from the WTP to Area A broke near the intersection of North Market Street and Schifferstadt Boulevard. This break was repaired by the following day.

The ability of the WTP to supply Fort Detrick with sufficient quantities of quality drinking water is also dependent upon the rate of flow and quality of the water received from the Monocacy River. The WTP can provide 3.1 mgd of finished water to the Installation with the current distribution system without increasing the water pressure in the distribution lines (DHS and USAG, 2004a). The Water Appropriation and Use Permit limitation of a 2.0 mgd average withdrawal of water on a yearly basis from the Monocacy River is also a limiting factor. Water losses at the Installation amount to 904,000 gallons per month or 10,848,000 gallons/year. The water losses result from building sprinkler system and waterline flushing, fire hydrant testing, water pressure and flow testing, evaporation from the cooling towers, laboratory process use, repairs to the water distribution system, outside water usages in the family housing area, irrigation, and fire protection. Currently BMPs have been implemented to minimize water usage during testing and flushing (USAG, 2000b).

The unusually high amount of water consumed at the Installation in FY 2004 was due to major leaks (see Table 4-3). As a result, USAG completed a survey that identified leaks in the water distribution system. Several leaks were repaired and a leak test is now conducted annually. The repair of these leaks enabled the WTP to satisfy consumption demands with decreased production at the WTP for FY 2005 as compared with FY 2004. It is estimated that approximately 4 percent of the water losses at the Installation occur from leaks in the water distribution and wastewater collection systems (Potter, 2005b; DHS and USAG, 2004a).

The Fort Detrick Environmental Management System (EMS) includes Environmental Quality Control Committee (EQCC)-approved targets aimed at water conservation. These environmental targets are described in further detail in Section 4.15.6.2. The EQCC coordinates activities of the environmental programs at Fort Detrick with AR 200-1. The EQCC advises the command on environmental priorities, policies, strategies, and programs.

#### *4.5.4.4 Drinking Water Standards*

*The Safe Drinking Water Act (SDWA)*, 40 CFR 141, sets forth Federal water quality standards for drinking water, and it is implemented by the DA through AR 200-1. The National Primary Drinking Water Standards of the SDWA establish Maximum Contaminant Levels (MCLs) for various contaminants in drinking water. The Water Management Administration of the MDE monitors and enforces compliance with Federal drinking water standards. The drinking water quality is monitored by Fort Detrick personnel and by the MDE. Operators conduct daily testing at the WTP water quality laboratory. The WTP operators are properly certified in accordance with 40 CFR 141.70E, COMAR 26.05.A. (1) and AR 200-1.

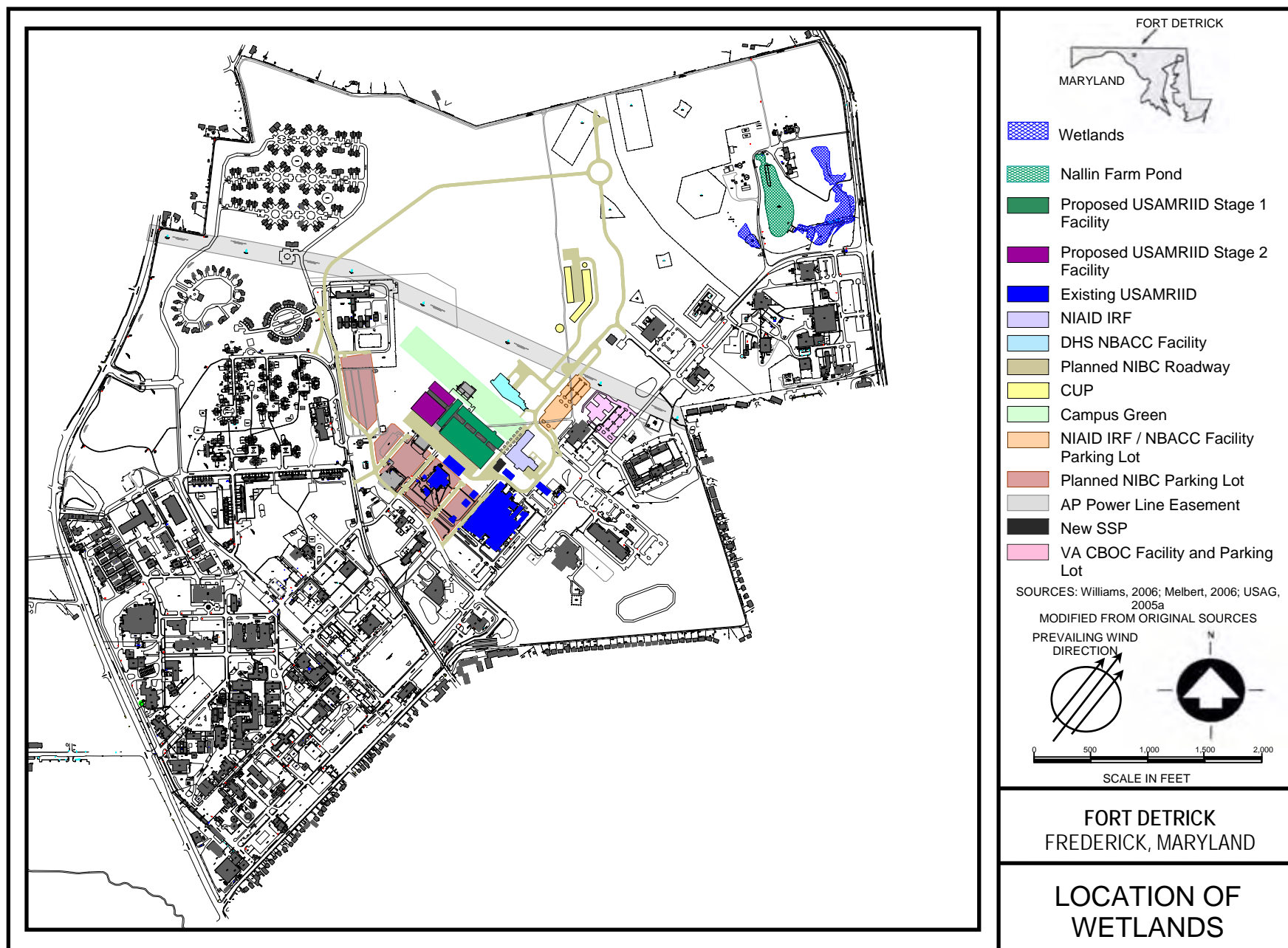
The MDE Water Supply Program issued a Notice of Violation (NOV) of the Surface Water Treatment Rule to the Fort Detrick WTP on 29 July 2005. The violation occurred on 18 July 2005, when turbidity measurements exceeded limitations of the NPDES permit. The violation has been attributed to deferred maintenance. As required, USAG provided a Tier 2 public notice to consumers of its water system within 30 days of the violation. This mandatory notice was distributed via mass e-mail, publication in the Fort Detrick Standard, and direct delivery to residences (Lewis, 2005b). A Corrective Action Plan (CAP) has been developed to prevent future turbidity excursions at the WTP. As part of the CAP, DIS has improved the maintenance schedule for the WTP by ensuring that there will be no less than four fully functioning sedimentation basins in operation at any given time (Lewis, 2006d). Additional measures that are prescribed in the CAP and will be undertaken by DIS include construction of a new sludge drying bed and replacement of faulty isolation valves at the WTP (Lewis, 2006e).

The MDE Water Supply Program issued an additional NOV to the Fort Detrick WTP on 1 February 2006. The violation occurred during July 2005, when one of the routine monthly samples submitted to MDE tested positive for fecal coliform bacteria. State and Federal regulations require three repeat samples within 24 hours of the initial sampling, and only one repeat sample was collected (Lewis, 2006d). The MDE waived the consumer notification requirement for this NOV, but Fort Detrick will be required to include details of the incident within the upcoming 2005 Consumer Confidence Report (Lewis, 2006e). As part of the corrective action for this NOV, the Environmental Management Office (EMO) is currently generating a Drinking Water Monitoring Plan that details all sampling requirements at the WTP (Lewis, 2006d).

#### **4.6 WETLANDS AND FLOODPLAINS**

Wetlands are jointly defined by the USEPA and the USACE as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (40 CFR 230.3(t) and 33 CFR 328.3(b)). Wetlands on Fort Detrick are beneficial to stormwater management, erosion control, and sediment control. They also provide habitat for ducks, geese, herons, shore birds, muskrat, mink, and beaver and support numerous species of annual and perennial herbaceous plants (USAG, 2001). Federal activities within floodplains and wetlands are restricted under EO 11988, 33 CFR 1977, EO 11990, and AR 415-15 Appendix F-3. The INRMP for Fort Detrick serves as a guide for the management and protection of wetlands at Fort Detrick (USAG, 2001).

The wetlands on Fort Detrick are limited in size and number. A study conducted in October 2004 by USACE, *Wetland Delineation for Fort Detrick* (USACE, 2005a), included a thorough field reconnaissance of the Installation, including all of Area A. The study concluded that on Area A, “no wetland or potential wetland sites were found in any location other than the northeast corner.” The wetlands were differentiated and assigned “site” numbers based on standard wetland delineation methodology according to their dominant vegetative cover and landscape position. Five distinct wetland “sites” were identified in the northeast corner of Area A, all in the vicinity of Nallin Farm Pond. These five wetlands total 3.62 acres and are located approximately 3,200 ft. northeast of the proposed new USAMRIID Stage 1 and Stage 2 sites. The site reconnaissance identified 115 species of plants in the five wetland sites, consisting of 81 herbs, 15 shrubs and vines, and 19 trees (USACE, 2005a). The INRMP notes that there is great potential for development and expansion of this wetland habitat (USAG, 2001).



**Figure 4-7. Location of Wetlands in Area A.**

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